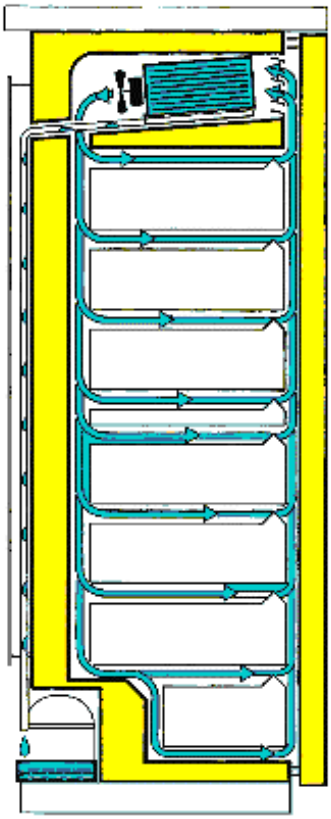
Electrolux

SERVICE MANUAL

REFRIGERATING



© Electrolux
Muggenhofer Straße 135
D-90429 Nürnberg
Germany

Fax +49 (0)911 323 1022

Spares Operation
Ausgabe: 05.01

Publ.-Nr.:
599 51 15 61
685
DE

NO-FROST CONTROLLER(S) 12/93 UNTIL MID-1997

(IN DEEP FREEZERS, REFRIGERANT R134a)

10. No-frost controllers, from date of manufacture 12/93

10.1 General

Technical modifications have been made on microprocessor controlled electronic controllers (power board and logical board). New electronic units are identified by the printed item numbers 675 125 933 and 675 125 934, which also are the part numbers. You can moreover identify the power board 675 125 933 from the separate PE connecting plug tag. On deep freezers with such electronic systems, the interference filter in the compressor tagboard will no longer be applicable, since it is now directly mounted on top of the electronic controller.

The paper below is focussing on the modifications, changed parameters being printed in bold letters! Consult the previous description, if necessary.

Technical support: please note that, from now on, only the mentioned power and logic boards will be available. So you should also consult Service Instructions 299 500 302 and associated Information Sheets 290 800 002 and 290 800 004. It is important that an interference filter is installed in the compressor tagboard, whenever the power board is **not provided with** a PE connecting line!

10.2 Superfrost Function

By pressing the Superfrost button, the Superfrost function can both be activated and deactivated.

Usually, the Superfrost function is automatically stopped at -32°C air temperature. In order to avoid too short operation time with minor charging, the Superfrost function is stopped after 30 hours only, at the earliest. If air temperature of -32°C is not reached, the electronic controller stops the Superfrost function after **51 hours**.

10.3 Determination of actual temperature to be displayed, visible on the LC display

In order to suppress during one control cycle, and especially during the defrosting phase, the display of air temperature oscillation inside the deep freezer, actual temperature is averaged for display.

On start-up, super mode and after door opening, the display shows the temperature detected by the air temperature sensor. When reaching the preset nominal temperature, the latter will be displayed. Any set point deviations within a bandwidth of +/-2K are suppressed. That is, the displayed temperature will always be equal to the nominal value, so long as the actual temperature is within such a bandwidth.

Averaging will be stopped after door openings, on super mode, after any air temperature changes, and as soon as actual temperature passes beyond the defined bandwidth. In order to avoid temperature steps in normal mode, air sensor temperature is displayed after two differing retard periods only.

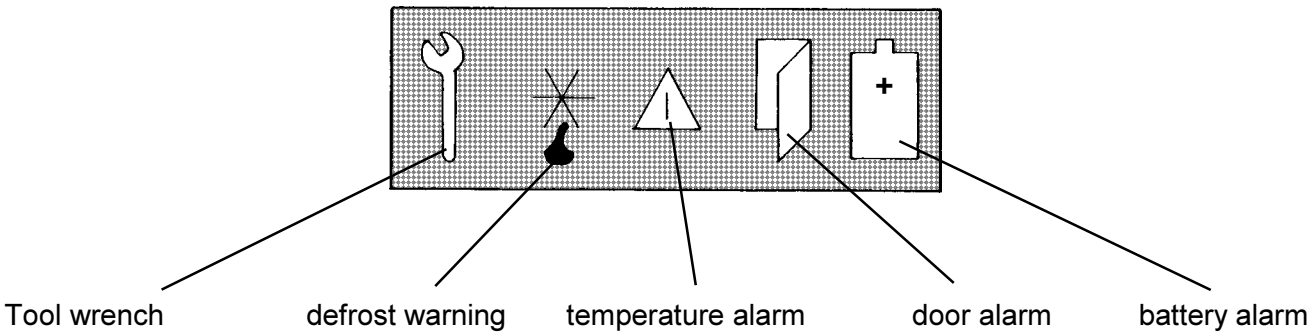
The 2 changing speeds are defined as follows:

- during heating up:
  temperature change within 12min by max. 1 K;
- during cooling:
  temperature change 1 min each per 1 K

Exception:
On battery mode, the displayed temperature equals the measured temperature plus a correcting value of 1 K.

Averaging will be reactivated when set point and actual temperature are equivalent again (set point = actual temperature).

10.4 Control and Information System (monitor; LED display)



10.4.1 Function warning (tool wrench)

Like on the electronic controllers used up to now, this warning will be activated on sensor failures, defrost-heating failures, faults in the refrigeration cycle, and defective temperature selector switches.

Changes, compared with the previous no-frost controller

Defrost-heating failures

The electronic system recognizes defrost-heating failures by means of the evaporator thermal sensor, comparing evaporator temperatures at the beginning of the defrosting phase and **15 min** afterwards. If no temperature increase > 10 K occurs, the function warning is displayed.

Diagnosis of Errors

To facilitate the diagnosis of errors, the occurring faults are classified by means of an error code. Each code is displayed on the green temperature display (LC display) while the quit key is pressed and the temperature setting button extended.

Monitor (LED display)	Temperature Display (LC display)	Cause of Trouble (defective component)
Tool wrench	F1	Temperature selector defect
Tool wrench	F2	Air temperature sensor defect
Tool wrench	F3	Refrigerator sensor defect
Tool wrench	F4	Heating system defect
Tool wrench	F5	Refrigeration cycle defect

10.4.2 Defrost warning

Defrost warning responds, as soon as the air temperature is heated up to -2°C. This warning is displayed both optically and acoustically. The highest temperature in the freezer is displayed alternating with the actual temperature.
You can reset the defrost warning by using the quittance key (no automatic reset). After reset with the quittance key, the highest temperature is no longer on display.
When starting up, the defrost warning is suppressed until display temperature is **by 4 K** higher than the set point temperature.

10.4.3 Temperature alarm

Temperature alarm is activated, once the actual temperature is by 5 K higher than set point temperature.
You can switch off the alarm by pressing the acknowledge key. Acoustic and optical temperature warning are automatically reset, once the actual temperature is only 4 K higher than the set point temperature (alarm off value).
After adjusting the set point temperature, the temperature warning is disabled, and release can be activated only if the warning off value is reached, or if the actual temperature exceeds 10°C.
15 sec after starting up, an optical warning is displayed. However, if you bypass the self-test, this will occur immediately!
The alarm signal will be suppressed until the warning off value is reached for the first time. In Super mode, the alarm signal is blocked.

10.4.4 Door alarm

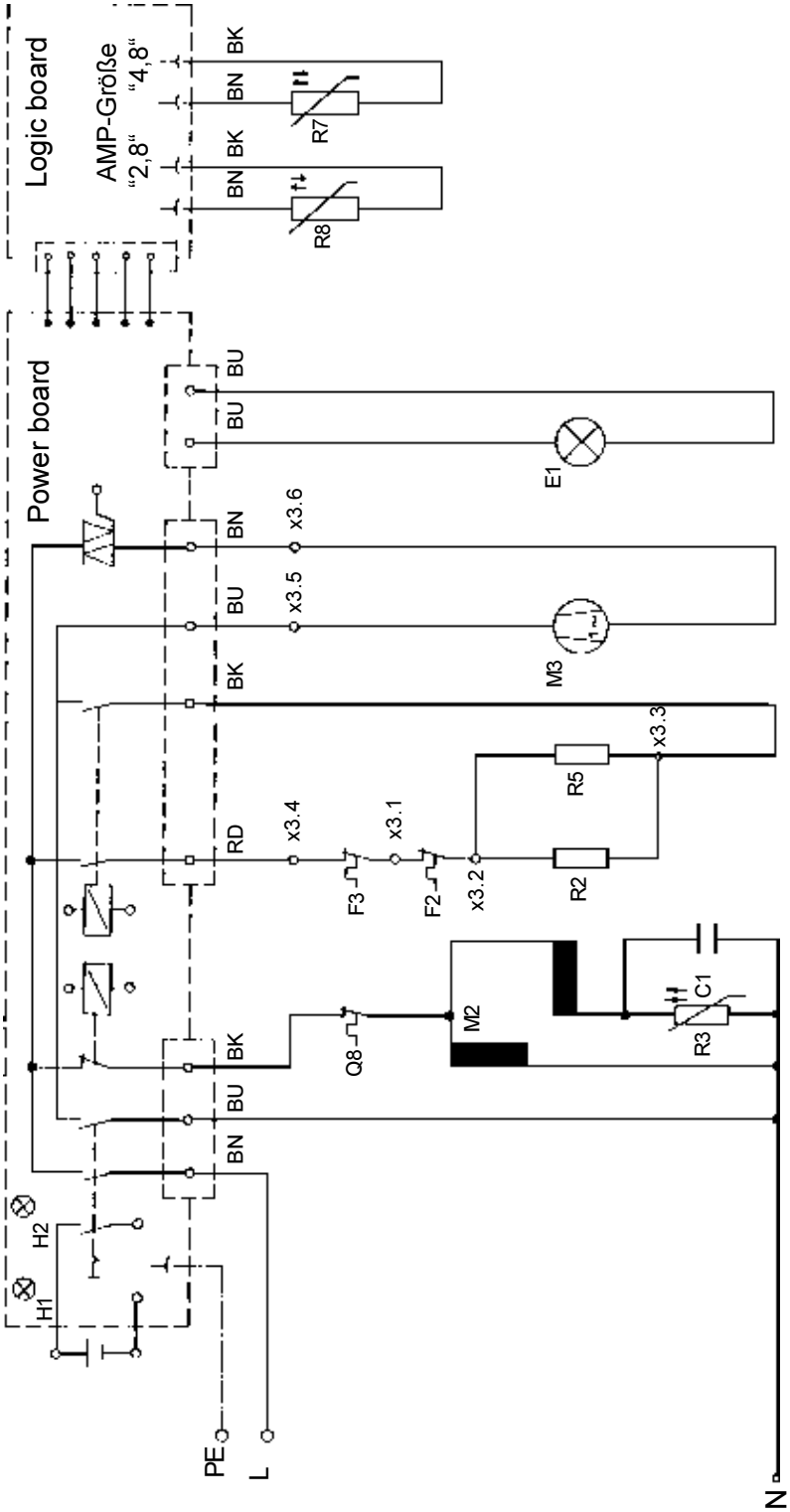
Opening the door directly activates door alarm message on the monitor. If the door remains open for more than 80 sec, the alarm goes off. After closing the door, the door alarm is reset. It is separately possible to switch the alarm off by using the acknowledge key. The door alarm function is disabled during battery operation!

10.4.5 Battery alarm

The battery is checked 15 sec after starting up. However, when the self-test is bypassed, this will occur immediately! Battery voltage check is done after every battery replacement, after every mains failure, and prior to any defrosting cycle. If the battery voltage is too low, e.g. after 3 days of battery mode, the battery alarm will be activated. No acoustic warning available!

10.5 Connection diagram

Connection diagram S 33 **Part No. 675 092 101**



10.6 Connection diagram legend

C1	Betriebskondensator	running capacitor
	Kondensator	Condensateur
E1	Lampe	lamp
	Lamp	lampe
F2	Klixon-Abtauheizung	klixon defrost heater
	Klixon ontdooiweerstand	Clixon rêsistance de degivrage
F3	Klixon-Flächenheizung	klixon surface heater
	Klixon vlakweerstand	Clixon rêsistance plate
G1	Batterie	battery
	Batterij	Batterie
H1	Signallampe grün	signal lamp green
	Lamp groen	Lampe verte
H2	Signallampe gelb	signal lamp yellow
	Lamp geel	Lampe jaune
M2	Motorverdichter-Gefrieren	motor condenser freezing
	Kompressor (diepvries)	Compresseur (surgêlateur)
M3	Lüfter-Gefrieren	fan freezing
	Ventilator	Ventilateur
R2	Abtauheizung	defrost-heating
	Ontdooiweerstand	Rêsistance PTC (surgêlateur)
R3	Anlauf-PTC-Gefrieren	starting-PTC-freezing
	PTC weerstand (diepvries)	Rêsistance PTC (surgêlateur)
R5	Tauwasserheizung, Flächenheizung	defrost water heating, surface heating
	Dooiwatergootverwarming	Chauffage rigole eau dêgivrage
R7	Gefrierteil-Verdampferfühler	freezer evaporator sensor
	Verdampervoeler-diepvriesgedeelte	Sonde air ambient-partie surgêlateur
R8	Gefrierteil-Luftfühler	freezer air sensor
	Luchtvoeler-diepvriesgedeelte	Sonde air-partie surgêlateur

Farbdefinitionen - colour-definitions - Kleuren - Couleurs

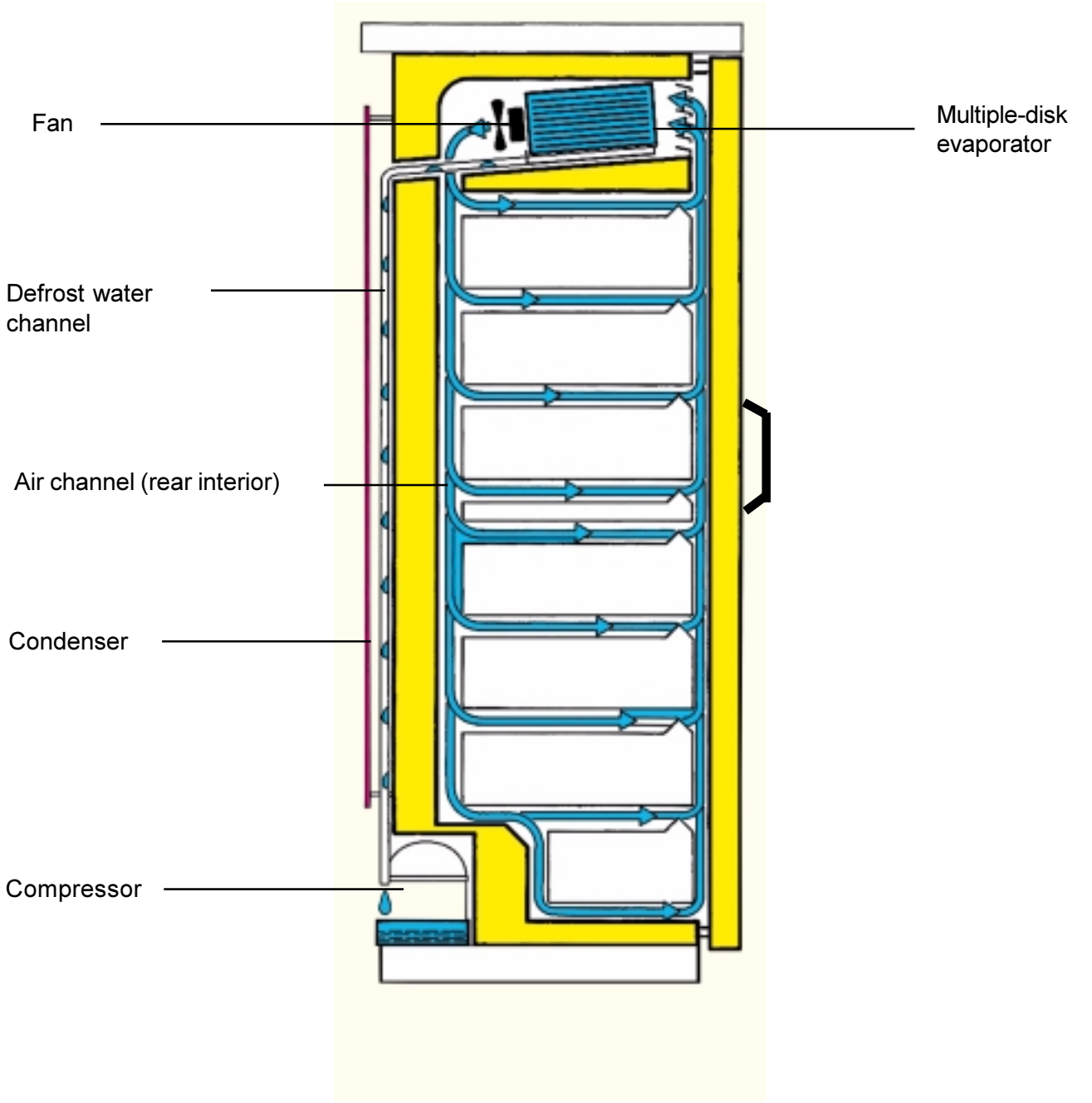
bk.....	black	schwarz	zwart	noir
bn.....	brown	braun	bruin	brun
bu.....	blue	blau	blauw	bleu
ye	yellow	gelb	geel	jaune
gn.....	green	grün	groen	vert
rd	red	rot	rood	rouge
wh.....	white	weiß	wit	blanc

All other functions are identical to the former series; sections enclosed to this document

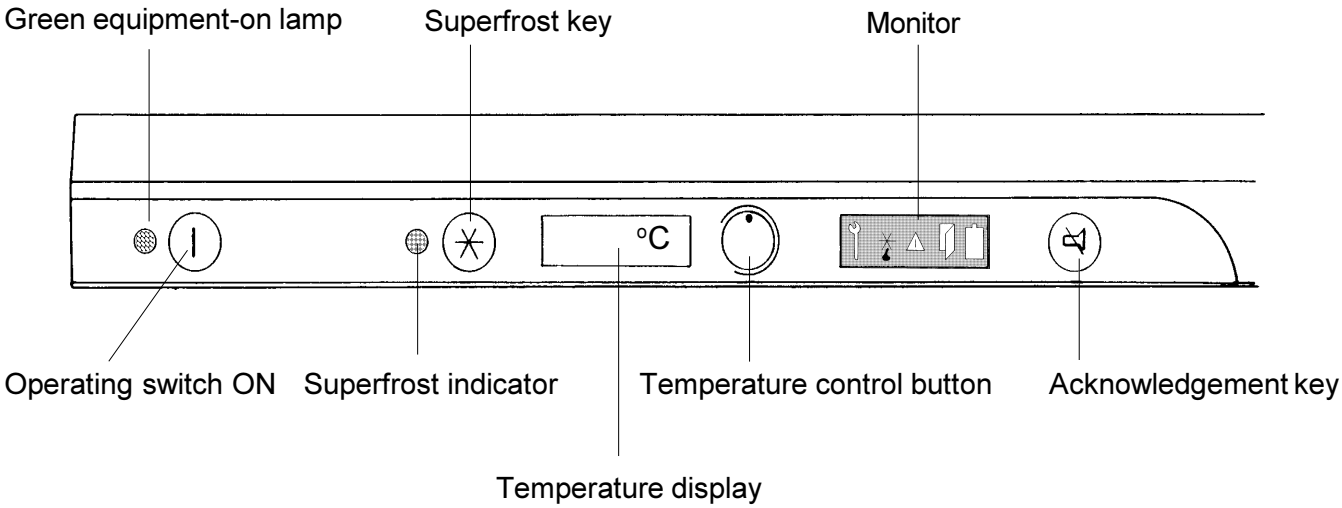
9. No-frost deep freezers (version with power board and logic board)

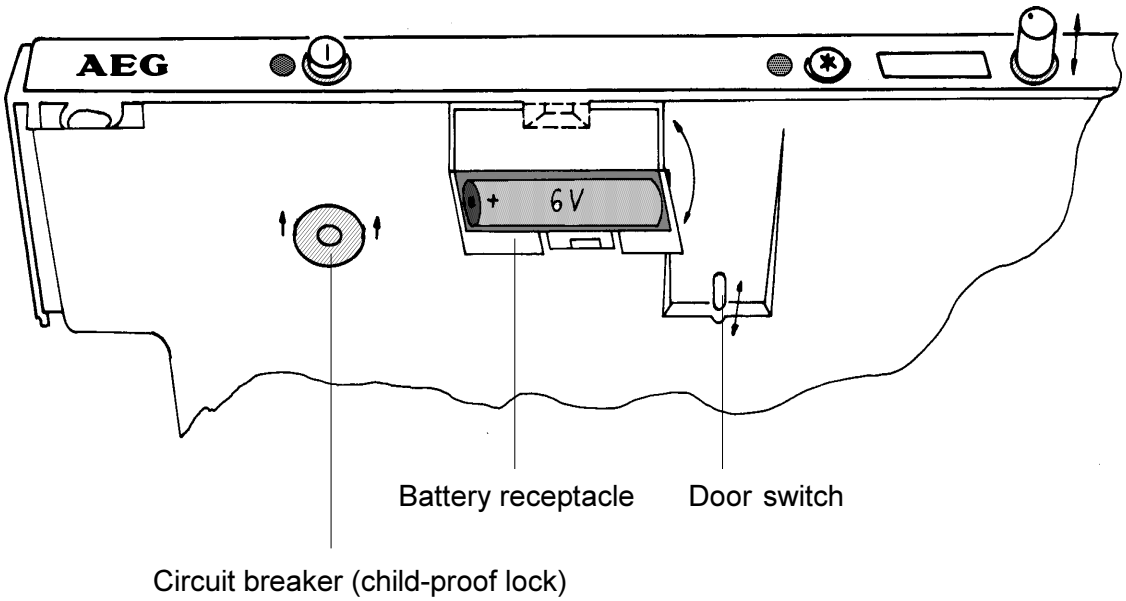
9.1 General

This no-frost series is equipped with an electronically controlled monitor; a microprocessor controlled regulation, the no frost air circulation system, as well as a child-proof lock. The vital benefits of this new technology are high temperature constancy in all levels, no formation of hair-frost on the freezing stock, automatic defrosting on demand, and the display and control systems.



9.2 Operation





9.2.1 Start-up/Switching ON

- Press the equipment-on switch until it clicks into place.
- Within the first 3 min after switching ON, the electronic controller runs a **self-test**.
- The compressor will start only after the self-test is completed.
- Defrost warning is not enabled, is in preparation once the temperature warning is reset.
- Temperature warning is only indicated by display.
- Switching ON without **self-test:**
  by pressing the Superfrost button and, at the same time, pressing the equipment-on switch, until it clicks into place.

9.2.2 Switching OFF

- Open the door
- Press the circuit breaker (child-proof lock) for enabling the operating switch.
- Important! It is **not possible** to switch the equipment OFF by pulling the mains plug! The electronic controller will continue to run in battery mode whenever mains power is cut. You can recognize this by a warning beep every 20 sec.

9.2.3 Temperature display (LCD)

- With the temperature control button extended, the set point temperature is flashing on the display.
- With the temperature control button pressed, the actual temperature is on display (temperature of freezing stock).

9.2.4 Temperature control

- Setting the set point temperature with the temperature control button extended
- You can set the required set point temperature by turning the temperature control button in 1 K steps from -15°C to -24°C.

9.2.5 Superfrost

See 10.2

9.2.6 Forced defrosting (manual defrosting)

- Extend the temperature control button
- Press the acknowledgement key and, at the same time, press the Superfrost button.

9.3.3 Battery mode/warning on mains failure

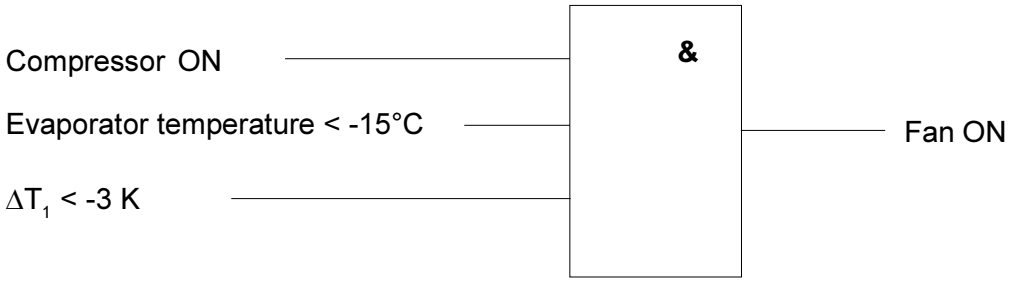
The equipment automatically changes over to battery mode, if, for whatever reasons, no mains voltage is applied. Control functions are maintained, but the compressor **is not** working!

- Immediately upon mains failure, an alarm is activated, emitting a signal every 20 sec.
- You can suppress the alarm for a period of 2 hrs by using the acknowledgement key. As a substitute, optical warnings (monitor) will be flashing for a period of 10 sec.
- The green equipment-on lamp goes off.
- The actual temperature is indicated in the temperature display, but not backlit, so you cannot read it.

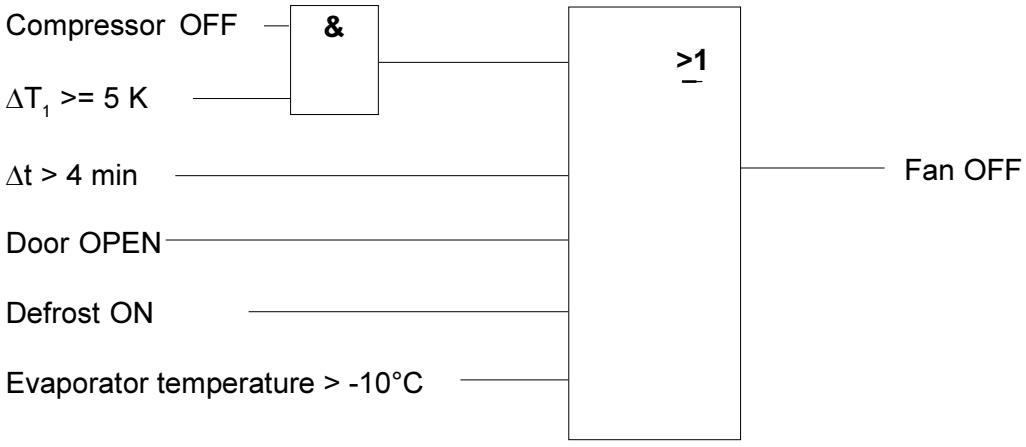
9.4 Regulating and control functions

9.4.1 Fan control (explanation with logic symbols)

- Switching ON the fan:



- Switching OFF the fan:



ΔT_1 = Evaporator temperature - air temperature
Δt = after-run time of fan, compared with the compressor
In case of malfunction of the temperature sensor, the fan is switched jointly with the compressor.

9.4.2 Fan control system (explanation with sentences)

9.2.4.1 Switching the fan ON

The fan is switched ON if the following three requirements are simultaneously met:
- compressor switched ON (compressor relay = voltage-free);
- temperature at the evaporator sensor (R7) below -15°C; and
- by more than 3 K colder than the temperature at the air sensor.

9.4.2.2 Switching the fan OFF

The fan is switched OFF if one minimum of the following requirements is met:
- temperature at the evaporator sensor is above -10°C; or
- the defrost cycle is reached (frosting time 60 hrs), or
- if the door is opened; or
- the fan is running for 4 min longer than the compressor; or
- compressor is switched OFF (compressor relay = operated) and, at the same time, the temperature at the evaporator sensor is higher by at least 5 K than the temperature at the air sensor.

9.4.4 Switching the compressor ON

The compressor is switched ON (relay = voltage-free), if
- the self-test is over,
- after expiring at least 5min after the compressor was switched off by the electronic controller (minimum standstill = 5min), and
- at the same time, the current temperature at the air sensor (actual temperature) is by 0.67 K minimum higher than the preset temperature (set point temperature).

9.4.4.2 Switching the compressor OFF

The compressor is switched OFF (relay = operated), if
- the current temperature at the air sensor is by 1 K minimum colder than the preset temperature (set point temperature), or
- the defrosting cycle is reached, or
- the previously started Superfrost function is finished.

9.4.4.3 Permanent compressor operation

The appliances are provided with the so-called “positive failure mode”, that is, the compressor is switched to permanent operation when the following faults occur:

- prohibited sensor resistances
  (such as sensor short circuit, break), or
- when the defrost-heater is defect, or
- if the temperature setter is defect
  (meaning that the logic board must be exchanged), or
- if malfunctions occur on the refrigeration cycle, or
- if the Superfrost function was selected; however, the Superfrost function is limited in time and temperature.

9.4.6 Heater control

9.4.6.1 Defrosting on demand

Automatic defrosting takes place after 60 hours of frosting time, at the beginning of the next standstill time of the compressor. If, after 65 hours, no standstill period has begun yet, the compressor is switched off, in order to start a defrosting cycle.

Frosting time = compressor operating time + 180 x door opening time

The defrosting cycle will be ended 4 min after switching off the heaters. Frosting time is set to “0”.

9.4.6.2 Switching the heaters ON

Defrosting heaters and surface heating are switched ON, if
- either defrosting on demand (after 60 hrs frosting time), or defrosting on demand is activated, and
- at the same time, the evaporator sensor is OK.

9.4.6.3 Switching the heaters OFF

Defrosting heaters and surface heating are switched OFF, if
- the temperature at the evaporator sensor is higher than 7°C, or
- since the beginning of the defrosting cycle, more than 40 min have passed, or
- the evaporator sensor is in failure.

9.6 Self-test

Within the first 3 minutes after switching ON, the electronic system runs a self-test.
Order of sequence:

- For 15 sec, all indicators are lit (power consumption approx. 9 mA*)
- For 15 sec, pause
- For 15 sec, the fan is switched on (power consumption approx. 30 mA*)
- For 15 sec, pause
- For 15 sec, the heaters are switched on (power consumption approx. 1.3 A*)
- For 105 sec, pause
- For 15 sec min., the compressor is switched on (power consumption > 0.5 A*)
  *where U_N = 230 V

9.7 Trouble-Shooting and Remedies

9.7.1 Malfunction with functional alarm activated (tool wrench)

Due to the intelligent control and display system, the following malfunctions are early recognized and indicated:
- Sensor failure
- Defrost-heating failures
- Faults of the refrigeration cycle
- Failure of the temperature control button

9.7.2 Sensor failure

The electronic is capable of detecting any sensor failure where prohibited resistance values occur. The table below shows the limit resistance values of evaporator and air temperature sensors. You should refer to this table for fault finding by means of resistance measuring.

Temperature [°C]	Resistance kΩ
-40	328,4
-30	173,9
-20	95,89
-10	54,89
0	32,51
10	19,86
20	12,49
30	8,06
40	5,33

If the measured resistance values are equal to the values mentioned in the table, the fault can only be located in the refrigeration cycle, the heaters or the temperature control button, that is, the logic board.

9.7.4 Faults of the refrigeration cycle

The electronic system recognizes a malfunction in the refrigeration cycle by determining the difference of temperature between evaporator and air temperature sensor.
Alarm message unless the evaporator temperature has not fallen below the air temperature by 3 K minimum within 15 min of switching on the compressor.
If the compressor operating time is < 15 min, then the problem check is interrupted.

9.7.5 Failure of the temperature control button

The electronic system signals a functional alarm when wrong resistance values of the temperature control button are detected (100 kΩ) - potentiometer).
Examination is possible with ohmmeter directly on the logic board.

- 3 soldering points in the triangle
- between the two outer soldering points = 100 kΩ
- between the central taps and one outer tap, depending on the control button position, 0-100 kΩ.

If the measured values are not correct, replace the logic board!

9.8 Test aid

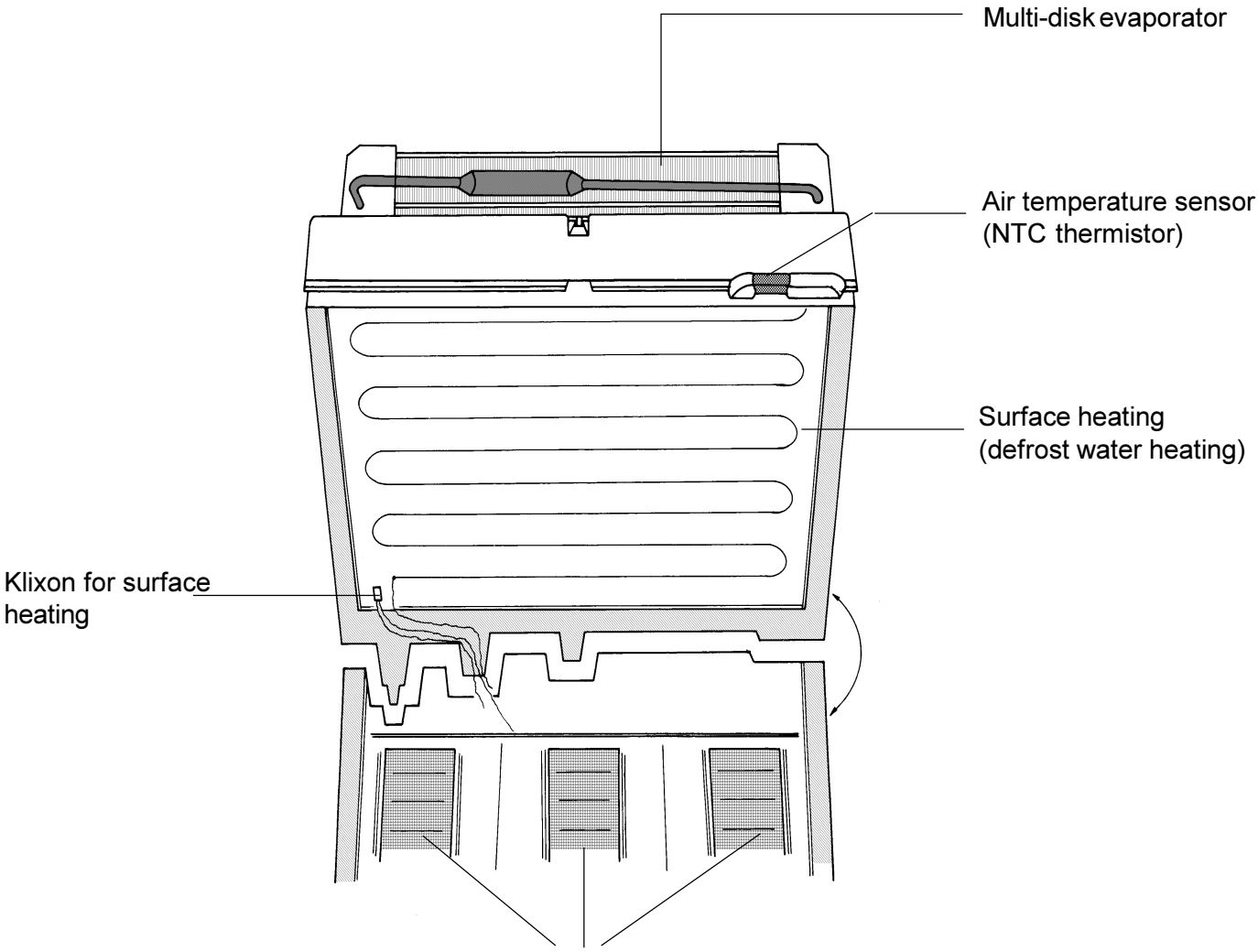
Problem	Cause and Remedy
- Evaporator in permanent mode, temperature display colder than -25°C, tool wrench lit	- Sensor, defrost-heater, temperature control button defect, or malfunction of the refrigeration cycle
- Fan only running during self-test, every 20 min the defrosting cycle is started, insufficient refrigerating capacity, tool wrench is not lit	- Light switch is not controlled or is defect. - Fan is switched off when evaporator temperature higher than -10°C (no fault)
- Peak power during cooling cycle (power supply and power input change due to fan pulsing)	- The electronic system will switch the evaporator on after a minimum standstill period of 5 min (no fault).
- After pressing the Super button, the evaporator is not immediately switched on.	- Improper sealing by door gasket, adjust the door or blow-dry the door gasket
- Hair-frost in front of the evaporator	

Equipment-Specific Part

Problem	Cause and Remedy
- Ice beneath the bottom drawer	- Defrosting water runs into the equipment. Check defrosting water discharge, funnel missing, defrosting water cannot be discharged into the funnel, funnel frozen up.
- Temperature leaps on display, defrost alarm (drop sign) is lit	- If refrigeration capacity is sufficient, there was a power failure. During defrosting, the highest and the current storage temperatures are displayed alternating.
- Temperature alarm is lit (triangle)	- No sufficient refrigeration capacity, or too much warm freezing stock has been stored.
- Condenser in permanent mode, evaporator is cold, however no refrigeration occurs in the other parts of the equipment, the tool wrench is not lit, selected temperature is not reached.	- Fan is disabled or defect, check and replace, if necessary
- Formation of ice on the evaporator	- Defrost-heater defect, surface heating defect, power board (relay) defect, door not correctly sealed
- Noise after closing the door	- Check the laying of the defrosting water discharge hose, suction pipe passage leaking
- After switching on, the condenser is not immediately started	- The electronic system will start the condenser after approx. 3.5 min only (see self-test, no fault)
- Inside lighting is permanently on	- Door switch is not activated; fold up the lower door bearing
- Temperature display, during longer period of door open, indicates a higher temperature than that selected	- No fault! Door has been opened sometime during the defrosting cycle.

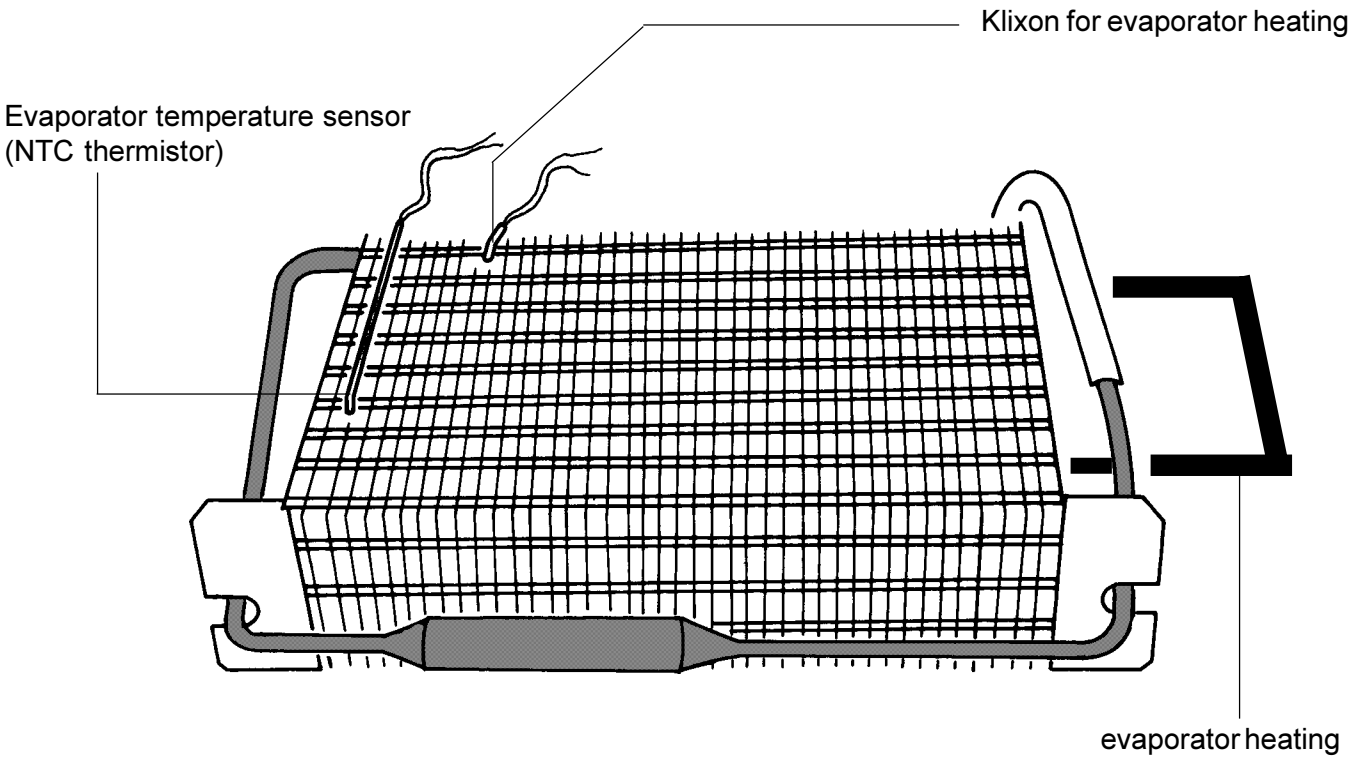
9.9 Components

9.9.1 Evaporator/Heating Unit



The three refrigerating accumulators will prevent the freezing stock from being heated too much during the defrosting cycle.
Customer cannot exchange the refrigerating accumulators!

9.9.2 Multi-disk evaporator



9.9.3 Pin assignment (Location: above left in the air channel)